Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Shielding of Electronics Equipment	)	RM-10330
Against Acts of War or Terrorism	)	
Involving Hostile Use of Electromagnetic	)	
Pulse (EMP)	)	

COMMENTS OF VERIZON[1]

I. Introduction and Summary

The Commission should not institute the requested rulemaking to require that all network telecommunications equipment and facilities be protected against extremely high levels of electromagnetic pulse ("EMP") generated by a terrorist attack, such as by encasing each item within a copper shield. The Commission rejected a similar request fifteen years ago, and the industry has since addressed the problem by adopting standards to deal with reasonably anticipated EMP levels. In contrast, the vastly higher EMP levels posed by petitioners are both more than can reasonably be anticipated. Adding to the level of shielding, as they request, would require a virtual rebuild of the entire telecommunications network, with costs running into the trillions of dollars, an unrealistic and unnecessary measure. Even the Department of Defense, in a publicly published standard, requires high levels of shielding for only the most sensitive military installations.

[1] The Verizon telephone companies ("Verizon") are the local exchange carriers affiliated with Verizon Communications Inc. listed in Attachment A.

II. Background

The petitioners here renew a request they made fifteen years ago, which the Commission denied, to institute a proceeding to determine if any measures should be taken to shield the country's telecommunications network against disruption from high levels of EMP that could emanate from a hostile attack. *See Petition for Notice of Inquiry to Consider Requirements for Shielding and Bypassing Civilian Communications Systems from Electromagnetic Pulse Effects*, 1 FCC Rcd 1126 (C.C.B, 1986); aff'd on recon., 2 FCC Rcd 2739 (1987). They theorize that there may be a terrorist threat or act of war involving use of EMP – a form of energy – which will not harm persons or property but with consequences that could include

> disabled cards, trucks and buses by the hundreds of millions (due to 'fried' electronic ignitions) … crashing aircraft, perhaps by the dozens (due to 'fried' guidance and flight systems, compounded by the termination of contact with air traffic controllers) … widespread, long term electricity 'blackouts' … bank records, stock records and other computerized records wiped clean .. and much, much more.

Petition at 10-11 (ellipses in the original). Although they claim that there is a potential for all of these disasters, they focus here only on possible disruption to landline telecommunications. They want the Commission to require that virtually every single piece of electronics in the entire telecommunications infrastructure of the United States be shielded with copper or other material by 2008. The petitioners provide no estimate of the cost of instituting this level of protection nor suggest how it will be financed.

III. Argument

The petition should be denied, because, contrary to the petitioners' claim that only federal intervention will protect the telecommunications network against an EMP attack, the telecommunications industry is already dealing with the issue raised, and petitioners have

provided no valid showing that anything more is needed. When the Commission denied the same petitioners' request in 1986, it found that the record there demonstrated that the public interest would not be served by further Commission investigation. It also acknowledged that technical work was then underway in industry standards bodies to adopt standards for EMP protection. That technical work has now concluded with a series of standards designed to protect telecommunications networks against EMP at reasonably anticipated levels, as well as standards for installations requiring higher levels of protection, and those standards have largely been implemented by the industry, as discussed below.[2]

The petitioners, however, without addressing the industry standards, ask the Commission to require carriers to install shielding to protect the network against extremely high EMP levels – levels which the petitioners merely theorize could be experienced with a terrorist attack. Such shielding, the petitioners state, would require that every single electronic device in the network be completely encased in copper or some material that will not conduct EMP so that it can withstand extremely high levels of EMP. They propose that all new equipment installed on or after July 2004 meet that standard and that all existing equipment be retrofitted by January 2008. *See* Petition at 28-34.

Such action is unrealistic and unnecessary. It would require protective measures taken for the entire telecommunications infrastructure of the country that the Department of Defense has found are needed only on military installations that perform

> critical, time-urgent command, control, communications, computer and intelligence (C^4I) missions. Facilities required to fully comply with the provisions of the standard will be designated by the Joint Chiefs of Staff, a Military Department Headquarters, or a Major Command.

[2] Those standards appear in a series of documents issued by the T1 Committee of the Alliance for Telecommunications Industry Solutions ("ATIS") between 1991 and 2001.

Department of Defense Interface Standard MIL-STD-188-125-1, *High-Altitude Electromagnetic Pulse (HEMP) Protection for Ground-Based C^4I Facilities Performing Critical, Time-Urgent Missions* at & 1.1 (July 17, 1998). As a result, even the Department of Defense does not require such measures for any but the most critical installations (defined above as C^4I facilities).

Of course, an EMP attack may not be confined to such highly sensitive installations but could theoretically occur anywhere. For example, a device could be detonated at a high enough altitude that it could affect broad areas of the country. Therefore, all electronic equipment in the nationwide telecommunications infrastructure, including electronic customer premises equipment, has to be considered potentially exposed to an EMP threat. However, contrary to the petitioners' claims, the telecommunications industry has long recognized the need for EMP protection against such attacks and has developed, within ATIS, a leading industry standards body, and implemented a series of standards to protect against the levels of EMP that can realistically be anticipated in the event of a non-localized attack (called "baseline" standards). As shown in the attached Declaration of Percy E. Pool ("Pool Decl."), the most effective way of meeting the requirements of baseline standards is through use of surge protectors and grounding techniques which will divert most of the EMP energy and prevent it from damaging the equipment.[3] By contrast, attempting to shield each item of equipment, which the petitioners advocate, will not prevent the EMP from entering the equipment through cables and wires and is therefore less effective.

While it is theoretically possible that an EMP attack could produce sufficient energy to harm grounded and protected equipment, such attacks are likely to be very localized and

[3] Many of the electrical protection measures currently employed in the telecommunications industry were initially designed to protect against lightning strikes but, due to the similar effects of EMP, they also provide an adequate level of protection from EMP.

concentrated on particularly sensitive and critical facilities. This is because a device that is detonated at a high altitude, which could disrupt communications over a wide area, is likely to disburse the energy such that no one locality would receive enough EMP to cause permanent damage to electronic equipment. Such a device would disrupt communications temporarily, just as sunspots cause sporadic communications outages, but it would not damage the equipment itself. *See* Pool Decl. at & 6. In the case of particularly sensitive facilities, such as those serving critical government installations, the carriers, where requested, have installed a higher level of shielding, also based upon an ATIS-developed industry standard, to prevent damage from a more localized high-power EMP attack.[4] The combination of these two levels of protection is sufficient to guard against the levels of EMP that can reasonably be anticipated in a terrorist attack In addition, by installing redundant facilities, such as currently exist in the network or are being planned in the wake of the September 11 attacks, telecommunications providers provide another layer of protection in the event of localized high-power EMP attacks, as well as making the network more survivable in the event of physical destruction of facilities.

The level of protection the petitioners want would require a nearly complete rebuilding of the telecommunications infrastructure of the United States in the next six years. Existing electronic equipment cannot readily be encased in copper or other non-conductor to prevent penetration by the EMP levels the petitioners request. Instead, each item would need to be redesigned and replaced to prevent EMP from penetrating and damaging it. This effort would likely cost in the trillions of dollars nationwide. The petitioners have provided nothing but speculation and theory to support their claim that such a massive effort is needed and, in any event, the timetable is highly unrealistic. Any wholesale redesign and replacement of electronics

[4] The requesting customer is billed for this additional work.

should coincide with the normal cycle of replacement. And, as shown above, even the Department of Defense does not advocate the petitioners' proposed level of protection for any but the most sensitive military facilities, much less civilian installations.

The petitioners here have made no showing that they are subject-matter experts. Instead, they merely speculate that the entire telecommunications infrastructure of the country could be destroyed in a terrorist attack without any expert technical support suggesting that the extremely high EMP levels they posit are within the realm of what can reasonably be anticipated. In fact, their only "evidence" is an alarmist article from the popular press (*Popular Mechanics*), the credentials of whose author are not even disclosed. In short, the petitioners' arguments are based entirely on unsupported theories, and the industry has already addressed the levels of EMP harm that can reasonably be anticipated.

As long ago as 1985, an EMP task force established by the National Security Telecommunications Advisory Committee formulated a policy statement in which it found that telecommunications providers

> will endeavor to work with the government, and with each other, to identify ways to minimize the effects of high-altitude [EMP] detonations on their systems, both individually and collectively….The common carriers and their suppliers will take those actions that are within their cost constraints to increase the resistance of their assets to [EMP]. Further, the common carriers will be responsive to requests for specific mitigation measures desired by the government and for which the government provides funding.

Electromagnetic Pulse (EMP) Final Report, EMP Task Force, National Security Telecommunications Advisory Committee (NSTAC), July 1985.

This statement is as true today as it was sixteen years ago. And the development and implementation of standards, both for levels of EMP that can reasonably be expected (*i.e.*,

baseline) and, where requested, for high levels of protection for sensitive installations, is fully consistent with the task force's recommendations.

IV. Conclusion

Accordingly, the petition should be denied.

Respectfully submitted,

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DECLARATION OF PERCY E. POOL

1. My name is Percy E. Pool and I am a Lead Engineer – Network Engineering, responsible for providing the Inductive Coordination and Electrical Protection staff support for Verizon's Network Services Group. I have been in this position since November 2000, before which I held a similar position with GTE Network Services since August 1989. I have participated actively in various standards committees, including the T1E1.7, and its predecessor T1Y1.4, and served as vice-chair from 1992 to 1996 and as Chair from 1996 to 2000. I currently serve as Vice-Chair of the T1E1.7 Working Group on Electrical Protection. I hold a Bachelor of Science degree in Electrical Engineering from the University of Texas at Austin. I am a Licensed Professional Engineer in the State of Texas.

2. I have reviewed the Petition for Notice of Proposed Rulemaking by Donald J. Schellhardt, Esquire and Nickolaus E. Legett dated September 25, 2001. The petitioners ask the Federal Communications Commission to adopt standards requiring every item of electronic equipment in the telecommunications network to be individually shielded against damage from electromagnetic pulse ("EMP").

3. The industry has already implemented protections that will prevent network harm from reasonably-anticipated EMP levels, and, in any event, the measures the petitioners propose to shield every piece of equipment in the network would not prevent harm from a highly-concentrated device capable of producing the very high EMP levels they posit.

4. By way of explanation, in general, as stated in ATIS industry standard T1-320-1994 (reaffirmed 1999), EMP fields can affect exposed electronics equipment by:

    - The direct illumination of electronics equipment that happens to be in the line of sight of the generation point; and by,
    - Inducing voltages onto cables for power, cable TV, antenna, and telecommunications that enter buildings or enclosures that house electronic equipment.

Protective measures for electronics equipment generally fall into two categories:

    - Shielding enhancements; and,
    - The minimization of induced voltages on cables that penetrate the exterior of buildings or enclosures that house electronic equipment.

5. Many of the electrical protection measures currently employed in the telecommunications industry are designed to protect against lightning strikes, but due to the similar effects of EMP, these electrical protection measures provide an adequate level of protection from reasonably anticipated EMP levels. The standards for such protections appear in Standard Nos. T1.308, 313, 316, 318 and 328 issued by the T1 Committee of the Alliance for Telecommunications Industry Solutions ("ATIS"), a leading telecommunications industry standards body. Consistent with these published industry standards, which are designed to protect against "baseline" (*i.e.*, reasonably anticipated) EMP levels, Verizon has implemented grounding, bonding and electrical protection measures compliant with T1.313 and 316 both in the central office and in outside plant. These measures will generally mitigate the EMP and direct it away from sensitive equipment so that it cannot cause harm, just as it mitigates harm from lightning strikes. Where a customer requests a higher level of

protection for particularly sensitive or critical facilities, Verizon implements, at the customer's expense, additional bonding, grounding, and electrical protection measures to provide further attenuation meeting ATIS standards T1.320 and 331, which address above-baseline protection levels.

6. Such above-baseline protection is used only for the most sensitive telecommunications facilities. This is because the energy released by an EMP device detonated at high-altitude – the most likely scenario – would be disbursed over a broad area. As a result, the energy reaching any office will be attenuated. To the extent that any outage occurs, it will be of short duration, similar to that that may occur during periods of high sunspot activity, and the affected equipment generally will not suffer permanent harm. It is only areas that may be the target of a more localized device that requires the above-baseline protection established through industry standards.

7. The remedy sought in the petition, encasing all equipment in copper or similar non-conductive material, will not provide a high level of EMP protection. This is because energy is likely to be introduced into the device through cabling and wiring, and the copper shielding generally cannot prevent such introduction.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on December __, 2001

_____
Percy E. Pool, P.E.